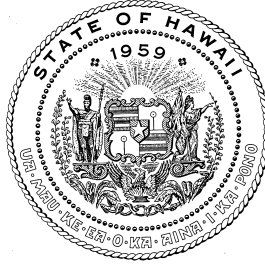


LINDA LINGLE
Governor of Hawaii



CHIYOME LEINAALA FUKINO, M.D.
Director of Health

**STATE OF HAWAII
DEPARTMENT OF HEALTH
CLEAN AIR BRANCH**



**2004
Annual Summary
Hawaii Air Quality Data**

2004 HAWAII AIR QUALITY DATA

Contents

LIST OF TABLES.....	ii
LIST OF FIGURES.....	iii
Section 1 INTRODUCTION.....	1
Section 2 DEFINITIONS	3
Section 3 SITE LOCATIONS AND DESCRIPTIONS.....	7
Section 4 2004 AIR QUALITY DATA	17
Section 5 2004 PM _{2.5} SPECIATION DATA.....	34
Section 6 AMBIENT AIR QUALITY TRENDS.....	37

LIST OF TABLES

Table	Title	Page
2-1	State of Hawaii and Federal Ambient Air Quality Standards.....	6
3-1	State of Hawaii Air Monitoring Network	11
3-2	Sampling Equipment at Each Monitoring Station.....	12
4-1	Annual Summary of 24-Hour PM ₁₀	18
4-2	Annual Summary of 24-Hour PM _{2.5}	19
4-3	Annual Summary of Nitrogen Dioxide.....	20
4-4	Annual Summary of 1-Hour Carbon Monoxide	21
4-5	Annual Summary of 8-Hour Carbon Monoxide	22
4-6	Annual Summary of 3-Hour Sulfur Dioxide	23
4-7	Annual Summary of 24-Hour Sulfur Dioxide.....	24
4-8	Annual Summary of 1-Hour Ozone	25
4-9	Annual Summary of 8-Hour Ozone	26
4-10	Annual Summary of 1-Hour Hydrogen Sulfide	27
4-11	Monthly Summary of 24-Hour PM ₁₀	28
4-12	Monthly Summary of 24-Hour PM _{2.5}	29
4-13	Monthly Summary of 24-Hour Nitrogen Dioxide.....	29
4-14	Monthly Summary of 1-Hour Carbon Monoxide.....	30
4-15	Monthly Summary of 8-Hour Carbon Monoxide.....	30
4-16	Monthly Summary of 3-Hour Sulfur Dioxide.....	31
4-17	Monthly Summary of 24-Hour Sulfur Dioxide	32
4-18	Monthly Summary of 1-Hour Ozone	33
4-19	Monthly Summary of 8-Hour Ozone	33
4-20	Monthly Summary of 1-Hour Hydrogen Sulfide.....	33
5-1	Annual Summary of PM _{2.5} Speciation.....	35
5-2	PM _{2.5} Speciation Analysis Methods.....	36

LIST OF FIGURES

Figure	Title	Page
3-1	Island of Oahu: Location of Air Monitoring Stations	13
3-2	Island of Kauai: Location of Air Monitoring Station.....	14
3-3	Island of Maui: Location of Air Monitoring Station.....	15
3-4	Island of Hawaii: Location of Air Monitoring Stations	16
6-1	PM ₁₀ Annual Average 2000-2004.....	38
6-2	PM _{2.5} Annual Average 2000-2004.....	38
6-3	Annual Average of Sulfur Dioxide 2000-2004	39
6-4	Annual Average of Nitrogen Dioxide 2000-2004.....	39
6-5	Annual Average of Daily Maximum 1-Hour Ozone 2000-2004.....	40
6-6	Annual Average of Daily Maximum 1-Hour Carbon Monoxide 2000-2004	40
6-7	Annual Average of Daily Maximum 8-Hour Carbon Monoxide 2000-2004	41

Section 1

INTRODUCTION



Kapolei Monitoring Station

The Department of Health, Clean Air Branch, monitors the ambient air in the State of Hawaii for various gaseous and particulate air pollutants. The U. S. Environmental Protection Agency (EPA) has set national ambient air quality standards (NAAQS) for six criteria pollutants: carbon monoxide, nitrogen dioxide, sulfur dioxide, lead, ozone, and particulate matter (PM₁₀ and PM_{2.5}). Hawaii has also established a state ambient air standard for hydrogen sulfide. The primary purpose of the statewide monitoring network is to measure ambient air concentrations of these pollutants and ensure that these air quality standards are met.

In 2003, the State of Hawaii began participating in the national PM_{2.5} speciation monitoring program. When EPA reevaluated the particulate matter NAAQS, it was determined that chemical speciation was essential for establishing a relationship between particle concentrations and adverse health effects. Additionally, speciation data would also provide valuable information for characterizing aerosols, determining the effectiveness of control strategies, and in understanding the effects of particle pollution on atmospheric and regional haze. The speciation monitor for Hawaii is located at the Pearl City air monitoring station.

Air pollution is caused by many different man-made and natural sources. There are industrial sources of pollution, such as power plants and refineries; mobile sources, such as cars, trucks, and buses; agricultural sources, such as cane burning; and natural sources, such as windblown dust and volcanic activity. In 2004, the state maintained 17 air monitoring stations on 4 islands. Most commercial, industrial, and transportation activities and their associated air quality effects occur on Oahu, where 10 of the stations are located. However, in October 2004, the Waikiki station was permanently discontinued with carbon monoxide monitoring continuing at the University Square station. Maui and Kauai each have one monitoring station, mainly to measure the air quality impacts from agricultural activities. The ongoing eruption of the Kilauea Volcano and air quality impacts associated with geothermal energy production are being monitored at five stations on the island of Hawaii. Current plans are to continue sampling at these sites; however, relocations, additions and/or discontinuations can occur in the future as the need arises.

This report summarizes the validated air pollutant data collected at the 17 monitoring stations during calendar year 2004. Tabular summaries are provided which compare the measured concentrations with federal ambient air quality standards. The 2004 speciation data is also included in this report. Trend summaries of pollutants that have at least five years of data are depicted graphically.

The Department of Health also has a web site that displays near real-time air quality data from specific monitoring stations on Oahu and the Big Island. Data is posted approximately two hours after collection and is updated throughout the day. The data has not been reviewed for quality assurance and is subject to change but provides the public with viewing access to current air pollutant and meteorological information. To view this data online, go to www.hawaii.gov/health/environmental/air/cab/index.html and link to "View the Online Air Quality Data."

To view this entire book as well as books from 2002 and 2003 online, go to: www.hawaii.gov/health/environmental/air/cab/index.html and link to "Hawaii Air Quality Data Book."

Questions or comments regarding data in this report and other air quality information should be addressed to:

Clean Air Branch
P.O. Box 3378
Honolulu, Hawaii 96801-3378
Phone: 808-586-4200
Fax: 808-586-4359

The Department of Health provides access to its programs and activities without regard to race, color, national origin (including language), age, sex, religion, or disability. Write or call our Affirmative Action Officer at Box 3378, Honolulu, HI 96801-3378 or at (808) 586-4616 (voice) within 180 days of a problem.

Section 2

DEFINITIONS



Met tower with wind sensor

“Ambient Air”: The general outdoor atmosphere, external to buildings, to which the general public has access.

“Ambient Air Quality”: The quality or state of purity of the ambient air.

“Ambient Air Quality Standard”: A limit in the quantity and exposure to pollutants dispersed or suspended in the ambient air. Primary standards are set to protect public health, including sensitive populations such as asthmatics, children, and the elderly. Secondary standards are set to protect public welfare including protection against visibility degradation, and damage to animals, crops, vegetation and buildings.

“Carbon Monoxide”: Carbon monoxide (CO) is a colorless, odorless, tasteless gas under atmospheric conditions. It is produced by the incomplete combustion of carbon fuels with the majority of emissions coming from transportation sources.

“Collocated”: Procedure required for a certain percentage of PM₁₀ and PM_{2.5} samplers in the monitoring network. Collocated samplers determine precision or variation in the PM₁₀ or PM_{2.5} concentration measurements of identical samplers run in the same location under the same sampling conditions.

“Criteria Pollutants”: The six pollutants for which the EPA has established national air quality standards. The pollutants are ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, Lead and Particulate Matter (PM₁₀ and PM_{2.5}).

“EPA”: The United States Environmental Protection Agency. A federal agency established to protect human health and the natural environment.

- “Hydrogen Sulfide”: Hydrogen sulfide (H_2S) is a toxic, colorless gas with a characteristic “rotten egg” odor detectable at very low levels. Also known as sewer gas, it is naturally occurring from sources such as volcanic activity, geothermal energy exploration and bacterial decomposition of organic matter.
- “ $\mu\text{g}/\text{m}^3$ ”: Micrograms per cubic meter. This is the measurement of air quality expressed as mass per unit volume.
- “NAAQS”: National Ambient Air Quality Standards. These are pollutant standards that the EPA has established to protect public health and welfare. NAAQS have been set for carbon monoxide, nitrogen dioxide, PM_{10} , $\text{PM}_{2.5}$, ozone, sulfur dioxide, and lead. These are commonly referred to as criteria pollutants.
- “NAMS”: National Air Monitoring Stations. A subset of the SLAMS network, these sites are used to track trends in certain pollutants and must meet more stringent siting requirements, equipment type, and quality assurance criteria.
- “Nitrogen Dioxide”: Nitrogen dioxide (NO_2) is a brownish, highly corrosive gas with a pungent odor. It is formed in the atmosphere from emissions of nitrogen oxides (NO_x). Sources of nitrogen oxides include electric utilities, industrial boilers, motor vehicle exhaust and combustion of fossil fuels. NO_2 is also a component in the atmospheric reaction that produces ground-level ozone.
- “Ozone”: This is the main constituent in photochemical air pollution. It is formed in the atmosphere by a chemical reaction of nitrogen oxides (NO_x) and volatile organic compounds (VOCs) in the presence of sunlight. In the upper atmosphere, ozone (O_3) shields the earth from harmful ultraviolet radiation; however, at ground level, it can cause harmful effects in humans and plants.
- “Particulate Matter”: Any dispersed matter, solid or liquid, in which the individual aggregates are larger than the single molecules in diameter, but smaller than 500 microns. Particulate matter includes dust, soot, smoke, and liquid droplets from sources such as factories, power plants, motor vehicles, construction activities, agricultural activities, and fires.
- “ PM_{10} ”: Particulate matter that is 10 microns or less in aerodynamic diameter. These are considered “coarse” particles generally from sources such as road and windblown dust, and crushing and grinding operations.

- “PM_{2.5}”: Particulate matter that is 2.5 microns or less in aerodynamic diameter. Considered “fine” particles, these are generally a result of fuel combustion such as from motor vehicles, utility generation and industrial facilities. Fine particles can also be formed when gases, such as SO₂ and NO₂, are chemically transformed into particles.
- “SLAMS” State and Local Air Monitoring Stations. The Clean Air Act requires that every state establish a network of air monitoring stations for criteria pollutants, using requirements set by the EPA Office of Air Quality Planning and Standards.
- “Speciation” Part of the PM_{2.5} monitoring program, samples are analyzed for concentrations of selected ions, metals, carbon species, and organic compounds.
- “Sulfur Dioxide”: Sulfur dioxide is a colorless gas that easily combines with water vapor forming sulfuric acid. When sulfur dioxide mixes with atmospheric moisture the result is commonly known as acid rain. Emissions of sulfur dioxide are largely from sources that burn fossil fuels such as coal and oil. In Hawaii, another major source of sulfur dioxide emissions is from the eruption of Kilauea Volcano on the Big Island.
- “Vog”: Vog is a local term used when volcanic gas and particles combine with air and sunlight to produce atmospheric haze.

Table 2-1 State of Hawaii and Federal Ambient Air Quality Standards

Air Pollutant	Averaging Time ^a	Standards		
		Hawaii State Standard ^b ($\mu\text{g}/\text{m}^3$)	Federal Primary Standard ^c ($\mu\text{g}/\text{m}^3$)	Federal Secondary Standard ^d ($\mu\text{g}/\text{m}^3$)
Carbon Monoxide	1-hour 8-hour	10,000 5,000	40,000 10,000	40,000 10,000
Nitrogen Dioxide	Annual	70	100	100
PM₁₀	24-hour Annual	150 50	150 50	150 50
PM_{2.5}	24-hour Annual	--- ---	65 15	65 15
Ozone	1-hour 8-hour	--- 157	235 157	235 157
Sulfur Dioxide	3-hour 24-hour Annual	1,300 365 80	--- 365 80	1,300 --- ---
Lead^e	Calendar Quarter	1.5	1.5	1.5
Hydrogen Sulfide	1-hour	35	—	---

^a All averaging times are based on block averages except for the 8-hour ozone and the 8-hour CO standards, which are based on running 8-hour periods

^b Designated to protect public health and welfare and to prevent the significant deterioration of air quality. *Source: HAR §11-59-1*

^c Designated to prevent against adverse effects on public health. *Source: 40CFR Part 50*

^d Designated to prevent against adverse effects on public welfare, including effects on comfort, visibility, vegetation, animals, aesthetic values, and soiling and deterioration of materials. *Source: 40CFR Part 50*

^e Ambient air monitoring for lead was discontinued in October 1997 with EPA approval. Levels in the state were far below the federal standard since sampling began. With the elimination of lead in gasoline, measured levels were consistently zero or nearly zero.

Section 3

SITE LOCATIONS AND DESCRIPTIONS



Kapolei Station PM₁₀ sampler inlet

This section provides detailed descriptions of the monitoring stations in the State of Hawaii. Table 3-1 lists the air pollutant(s) measured at each monitoring station, characterizes the area surrounding the station, and indicates the start dates for air monitoring at the station. Table 3-2 identifies the type of sampler used to measure the concentration of each criteria air pollutant. Figures 3-1, 3-2, 3-3 and 3-4 are maps showing the location of each monitoring station on the islands of Oahu, Kauai, Maui and Hawaii, respectively.

Except for the Puna H station on the Big Island, coordinates for all stations were collected using a carrier phase global positioning system (GPS) with a mapping accuracy of approximately one meter. The coordinates for the Puna H station were collected using a handheld GPS with a mapping accuracy of approximately seven meters.

ISLAND OF OAHU

1. Honolulu: Located on the roof of the Department of Health building at 1250 Punchbowl Street in downtown Honolulu, this site is in a commercial, institutional, and residential area. Originally established in 1960, this is now a SLAMS PM_{2.5}, and SO₂ station and a NAMS PM₁₀ and CO site. The coordinates are 21°18'27.27098" N latitude and 157°51'19.52241" W longitude, altitude is 20 meters above Mean Sea Level.

2. Pearl City: Located atop the Leeward Medical Center at 860 Fourth Street, the area has a combination of commercial, industrial and residential units and is approximately nine and a half miles northwest of downtown Honolulu. This site was established in 1980 and is currently a NAMS PM₁₀ and a SLAMS PM_{2.5} station. Also, in 2003, PM_{2.5} speciation monitoring began at this station. The coordinates are 21°23'34.19856" N latitude and 157°58'08.85360" W longitude, altitude is 23.12 meters above Mean Sea Level.

3. Waimanalo: Located within the Waimanalo Sewage Treatment Facility at 41-1069 Kalanianaʻole Highway, this site is in a rural agricultural community. Waimanalo is on the windward (upwind) side of Oahu approximately ten miles east-northeast of downtown Honolulu. This site was first established in 1972 and is now a SLAMS site sampling for PM₁₀. The coordinates are 21°20'16.21667" N latitude and 157°42'16.6539" W longitude, altitude is 6.65 meters above Mean Sea Level.

4. Sand Island: Located at the University of Hawaii's Anuenue Fisheries in the Sand Island Industrial Park, the area is composed of light industrial, commercial, recreational, and harbor units and is approximately two miles southwest (typically downwind) of downtown Honolulu. Established in 1980, this is an ozone NAMS station and a PM_{2.5} SLAMS station. The coordinates are 21°18'13.81750" N latitude and 157°52'16.21590" W longitude, altitude is 5.27 meters above Mean Sea Level.

5. Waikiki: Located at 2131 Kalakaua Avenue, Waikiki is a commercial and residential area with vehicular and pedestrian traffic. It is approximately three miles southeast of downtown Honolulu. The station was established in 1980 as a NAMS site for the sampling of CO. With EPA approval, this station was discontinued in November 2004. The coordinates are 21°16'53.86923" N latitude and 157°49'50.70880" W longitude, altitude is 1.36 meters above Mean Sea Level.

6. Liliha: Located at Kauluwela Elementary School, 1486 Aala Street, this site is in a residential and commercial area downwind of the heavily traveled H-1 freeway, approximately one and a quarter miles north of downtown Honolulu. This NAMS station was established in January 1984 and monitors for PM₁₀. The coordinates are 21°19'08.57706" N latitude and 157°51'31.84786" W longitude, altitude is 17.87 meters above Mean Sea Level.

7. Makaiwa: Located at 92-670 Farrington Highway, this site is in a residential, industrial and agricultural area approximately twenty-five miles west of downtown Honolulu. This station is approximately one mile to the southeast of Hawaiian Electric Company's Kahe power plant. This site was established in July 1989 as a SLAMS station monitoring for SO₂. The coordinates are 21°20'39.36299" N latitude and 158°06'46.67939" W longitude, altitude is 50.9 meters above Mean Sea Level.

8. West Beach: Located within the Ko'Olina Golf Course, this site is in a resort, recreational, and residential area approximately 27 miles west of downtown Honolulu and 1.5 miles northwest of Campbell Industrial Park. This SLAMS station was established in February 1991 and monitors for NO₂, PM₁₀, and SO₂. The coordinates are 21°19'57.87475" N latitude and 158°06'50.86663" W longitude, altitude is 14.54 meters above Mean Sea Level.

9. Kapolei: This station is located at 2052 Lauwiliwili Street in the Kapolei Business Park near the entrance to Campbell Industrial Park. It is in a commercial and industrial area with nearby residential and agricultural lands. It is approximately 25 miles west of downtown Honolulu, originally established in February 1991 as a SLAMS site monitoring for NO₂, PM₁₀, PM_{2.5}, CO and SO₂. The coordinates are 21°19'25.48126" N latitude and 158°05'19.00562" W longitude, altitude is 17.92 meters above Mean Sea Level.

10. University: This station is located in the University Square building at 2617 South King Street. Bordered by South King Street and University Avenue, this station is in a largely commercial area with shopping centers, restaurants and shops and is in the vicinity of the University of Hawaii. Established in November 2002, this SLAMS station monitors for CO. The coordinates are 21°17'29.66208" N latitude and 157°49'17.37281" W longitude, altitude is 4.68 meters above Mean Sea Level.

ISLAND OF KAUAI

Lihue: This monitoring station is located in downtown Lihue at the District Health Office, 3034 Umi Street. This site is in a commercial and residential area with nearby agricultural areas. It is a SLAMS station that was established in January 1972 and samples for PM₁₀. The coordinates are 21°58'28.84947" N latitude and 159°21'58.09671" W longitude, altitude is 71.08 meters above Mean Sea Level.

ISLAND OF MAUI

Kihei: This station is located in Upper Kihei at Hale Piilani Park. Monitoring for particulates from sugarcane burning activities has been conducted in the Kihei area since 1996. In February 1999, the station was moved to Hale Piilani Park, which is in a residential and agricultural area, and monitors for PM₁₀ and PM_{2.5}. The coordinates are 20°46'51.58844" N latitude and 156°26'46.94337" W longitude, altitude is 46.52 meters above Mean Sea Level.

ISLAND OF HAWAII

1. Kona: This station is located on the grounds of the Konawaena High School at 81-1043 Konawaena School Road in Kealahou, Hawaii. This special purpose monitoring station was established in April 1997 to monitor for vog in the Kona area. The pollutant sampled at this site is SO₂. The coordinates are 19°30'27.83302" N latitude and 155°55'03.67861" W longitude, altitude is 479.61 meters above Mean Sea Level.

2. Hilo: Established in March 1995, this special purpose monitoring station for vog is located on the grounds of the Adult Rehabilitation Center of Hilo at 1099 Waianuenue Avenue. The pollutants sampled are SO₂ and PM₁₀. The coordinates are 19°43'03.22398" N latitude and 155°06'37.90606" W longitude, altitude is 136.76 meters above Mean Sea Level.

3. Puna E: Located in the Leilani Estates residential subdivision in Puna, it is approximately 1.5 miles southwest of the Puna Geothermal Venture power plant. Established in 1992, this station monitors for H₂S. The coordinates are 19°27'50.3594" N latitude and 154°53'55.34089" W longitude, altitude is 207.86 meters above Mean Sea Level.

4. Puna H: This H₂S monitoring station was established in November 2002 and is located in the Lanipuna Gardens subdivision in Puna. It is approximately one-half mile south-southwest from the Puna Geothermal Venture power plant. The coordinates are 19°28'18.6" N latitude and 154°53'20.5" W longitude.

5. Lava Tree: This station in Puna is located on the eastern border of the Lava Tree State Park in a residential and agricultural area near Nanawale Estates. It is approximately 1.4 miles northwest of the Puna Geothermal Venture power plant. The station was established in August 1993 and monitors for H₂S. The coordinates are 19°29'11.06393" N latitude and 154°54'11.22523" W longitude, altitude is 192.65 meters above Mean Sea Level.

Table 3-1 State of Hawaii Air Monitoring Network

	Station Type								
SITE	PM₁₀	PM_{2.5}	CO	O₃	SO₂	NO₂	H₂S	SITE DESCRIPTION	ESTABLISHED
OAHU									
Honolulu	N	S, C	N	-	S	-	-	Center City / Commercial	January 1960
Pearl City	N	S, C	-	-	-	-	-	Center City / Residential	July 1980
Waimanalo	S	-	-	-	-	-	-	Rural / Agricultural	January 1972
Sand Island	-	S	-	N	-	-	-	Center City / Commercial	January 1980
Waikiki	-	-	N	-	-	-	-	Center City / Commercial	November 1980
University	-	-	S	-	-	-	-	Center City / Commercial	November 2002
Liliha	N	-	-	-	-	-	-	Center City / Mobile	January 1984
Makaiwa	-	-	-	-	S	-	-	Rural / Industrial	July 1989
West Beach	S, C	-	-	-	S	S	-	Rural / Commercial	February 1991
Kapolei	S	S	S	-	S	S	-	Rural / Industrial	February 1991
KAUAI									
Lihue	S	-	-	-	-	-	-	Center City / Commercial	January 1972
MAUI									
Kihei	SPM	S	-	-	-	-	-	Suburban / Residential	February 1999
HAWAII									
Kona	-	-	-	-	SPM	-	-	Suburban	April 1997
Hilo	SPM	-	-	-	SPM	-	-	Center City	March 1995
Lava Tree	-	-	-	-	-	-	SPM	Rural / Agricultural	August 1993
Puna E	-	-	-	-	-	-	SPM	Rural / Agricultural	1992
Puna H	-	-	-	-	-	-	SPM	Rural / Agricultural	November 2002

N = (NAMS) National Air Monitoring Station

C = Collocated Site

S = (SLAMS) State and Local Air Monitoring Station

SPM = Special Purpose Monitoring Station, (for monitoring vog, geothermal energy production, or cane burning)

Table 3-2 Sampling Equipment at Each Monitoring Station

Monitoring Station	Sampling Method (Criteria Pollutants and H ₂ S)							
	PM ₁₀ Continuous Ambient Particulate Monitor	PM ₁₀ Manual Ambient Particulate Monitor (1 in 6 days)	PM _{2.5} Manual Ambient Particulate Monitor	CO Continuous Gas Filter Correlation Analyzer	SO ₂ Continuous Pulsed Fluorescence Ambient Air Analyzer	O ₃ Continuous UV Photometric Analyzer	NO ₂ Continuous Chemiluminescence Analyzer	H ₂ S Continuous Pulsed Fluorescence Ambient Air Analyzer
OAHU								
Honolulu	✓		✓ (daily)	✓	✓			
Pearl City	✓		✓ (daily)					
Waimanalo		✓						
Sand Island			✓ (1 in 6 days)			✓		
Waikiki				✓				
University				✓				
Liliha	✓							
Makaiwa					✓			
West Beach		✓			✓		✓	
Kapolei	✓		✓ (1 in 3 days)	✓	✓		✓	
KAUAI								
Lihue		✓						
MAUI								
Kihei	✓		✓ (1 in 3 days)					
HAWAII								
Kona					✓			
Hilo		✓			✓			
Lava Tree								✓
Puna E								✓
Puna H								✓

Figure 3-1: Island of Oahu - Air Quality Monitoring Stations

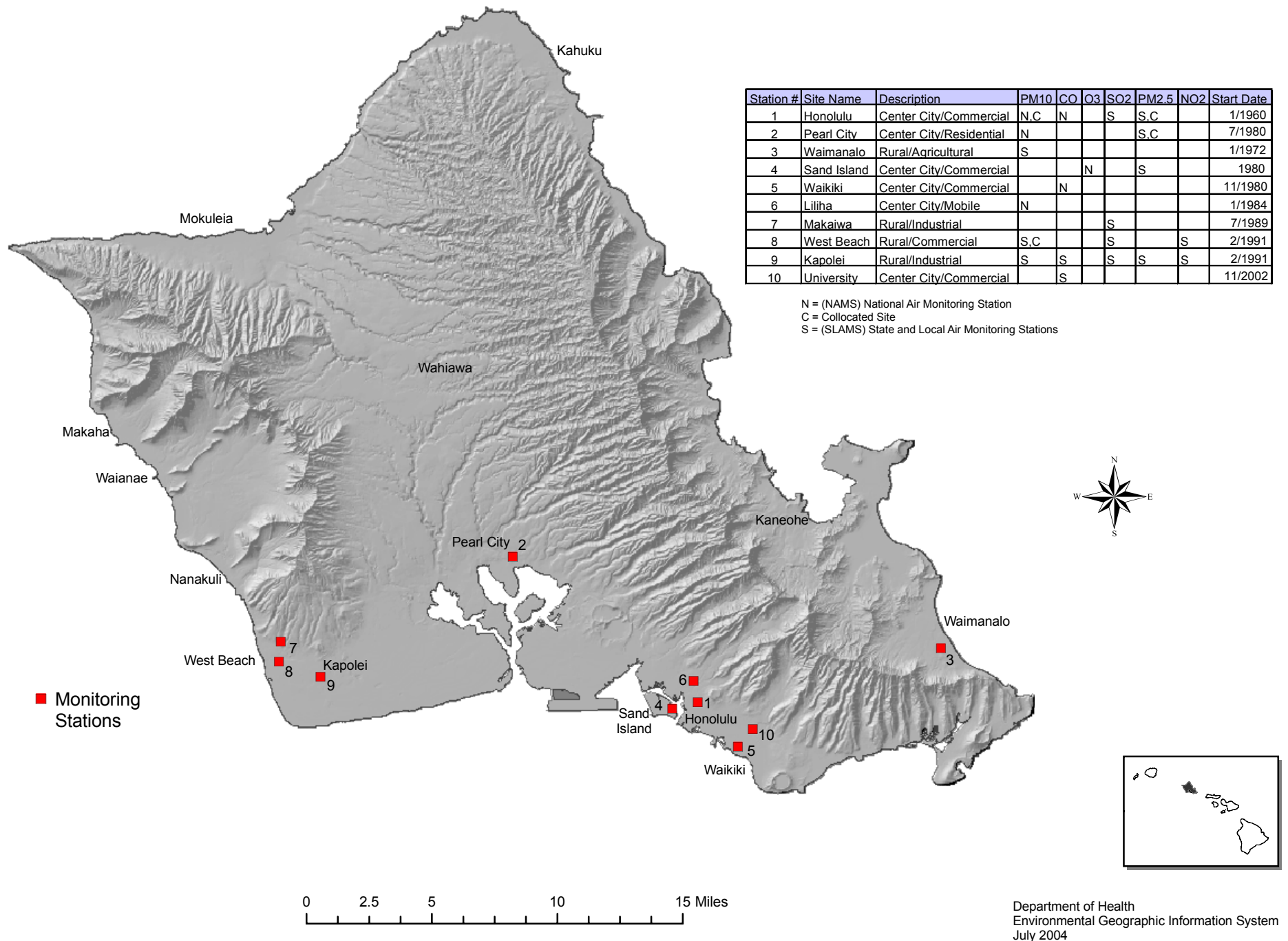


Figure 3-2: Island of Kauai - Air Quality Monitoring Stations

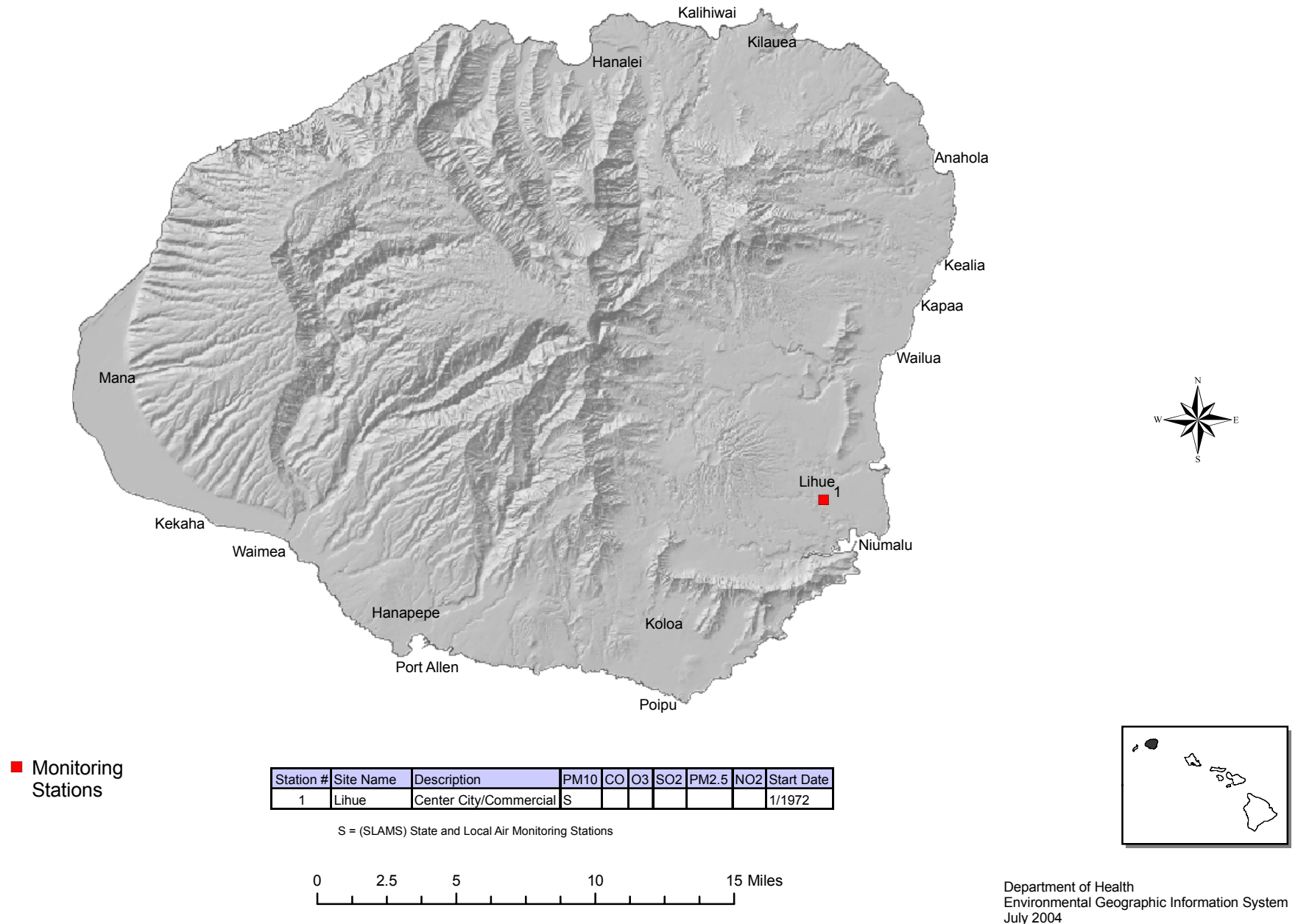


Figure 3-3: Island of Maui - Air Quality Monitoring Stations

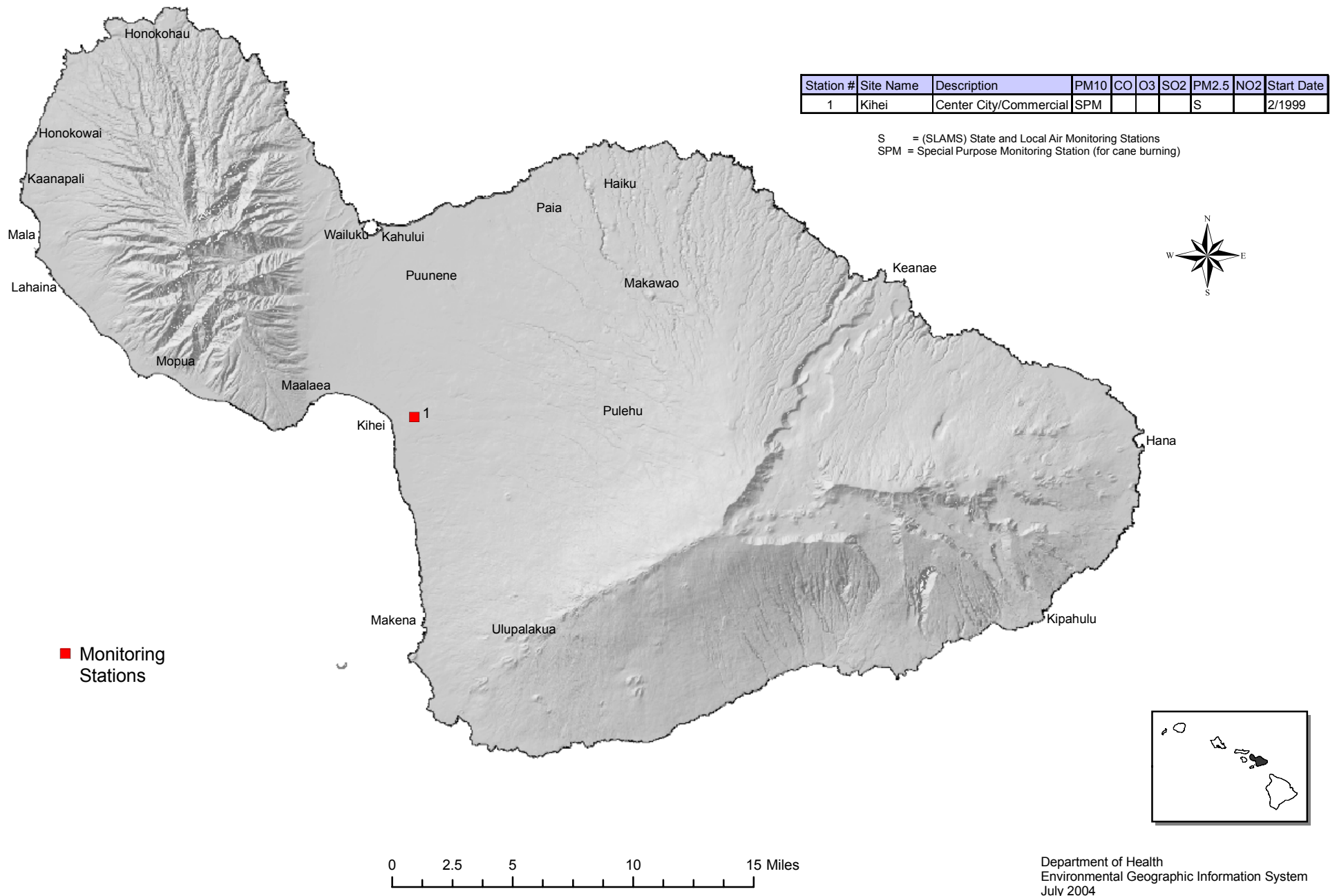
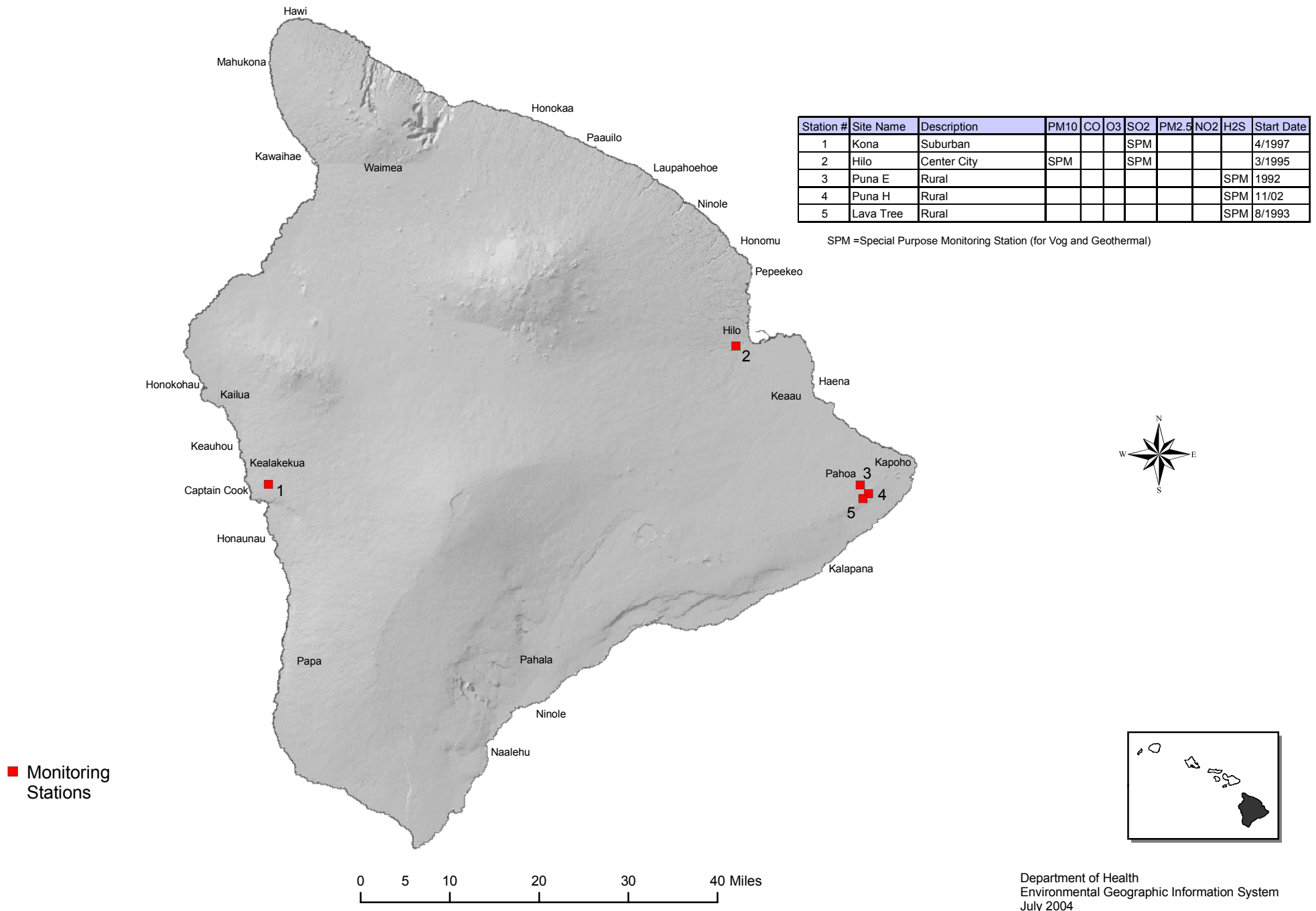


Figure 3-4: Island of Hawaii - Air Quality Monitoring Stations



Section 4

2004 AIR QUALITY DATA



Downtown Honolulu monitoring station at Kinau Hale

To protect the state's air quality from degradation, the Department of Health's Clean Air Branch is responsible for regulating and monitoring pollution sources to ensure that the levels of criteria pollutants remain well below the state and federal ambient air quality standards. Data collected from the ambient air network is audited to ensure that the reported data is of good quality and meets all quality control and assurance requirements.

The following tables summarize the pollutant concentrations measured at each monitoring station. Tables 4-1 through 4-10 are annual summaries grouped by pollutant and provide the number of occurrences exceeding the NAAQS. There is no federal ambient air quality standard for H₂S, and Table 4-10 provides the number of occurrences exceeding the state standard.

The annual statistics provided in tables 4-1 through 4-10 are the highest and second highest $\mu\text{g}/\text{m}^3$ values recorded in the year for the averaging period, and the annual means, which is the arithmetic mean of all valid hours recorded in the year. The "Possible Periods" is the total number of sampling periods in the year for the averaging time, "Valid Periods" is the total number of acceptable sampling periods after data validation, and "Percent Recovery" represents the amount of quality data reported.

Tables 4-11 through 4-20 are monthly summaries of the range and average of each pollutant for each averaging period. The range is the lowest and highest $\mu\text{g}/\text{m}^3$ values recorded in the month for the averaging period and the average is the arithmetic mean of all hours recorded in the month. The month with the highest valid value recorded in the year for each site is highlighted.

In the year 2004, the State of Hawaii was in attainment for all federal ambient air quality standards.

Table 4-1 Annual Summary of 24-Hour PM₁₀

	Annual Statistics			24-hour Occurrences Greater than 150 µg/m ³													Possible Periods	Valid Periods	Percent Recovery
	Maximum		Annual Means	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
	1 st High	2 nd High														All Hours			
OAHU																			
Honolulu ^b	39/36	35	13	0	0	0	0	0	0	0	0	0	0	0	0	366	342	93	
Liliha ^b	72/45/33	32	15	0	0	0	0	0	0	0	0	0	0	0	0	366	354	97	
Waikiki	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Sand Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
University	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Waimanalo ^a	27	22	15	0	0	0	0	0	0	0	0	0	0	0	0	61	40	66	
Pearl City ^b	131/94/32	31	15	0	0	0	0	0	0	0	0	0	0	0	0	366	335	92	
Makaiwa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Kapolei ^b	54/53	41	13	0	0	0	0	0	0	0	0	0	0	0	0	366	339	93	
West Beach ^a	22	22	13	0	0	0	0	0	0	0	0	0	0	0	0	61	58	95	
KAUAI																			
Lihue ^a	28	24	16	0	0	0	0	0	0	0	0	0	0	0	0	61	52	85	
MAUI																			
Kihei	65	63	19	0	0	0	0	0	0	0	0	0	0	0	0	366	308	84	
HAWAII																			
Kona	-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	-	-	-	
Hilo ^a	29	25	13	0	0	0	0	0	0	0	0	0	0	0	0	61	49	80	
Lava Tree	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Puna E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Puna H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

^a PM₁₀ sampling is once every 6th day

^b The first data listed is due to fireworks, the highest non-flagged value recorded in the year is in bold

Table 4-2 Annual Summary of 24-Hour PM_{2.5}

Annual Statistics																		
	<u>Maximum</u>		<u>Annual Means</u>	<u>24-hour Occurrences Greater than 65 µg/m³</u>														
	1 st High	2 nd High	All Hours	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Possible Periods	Valid Periods	Percent Recovery
OAHU																		
Honolulu ^c	20/15/10	10	4	0	0	0	0	0	0	0	0	0	0	0	0	366	352	96
Liliha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Waikiki	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sand Island ^a	10	8	5	0	0	0	0	0	0	0	0	0	0	0	0	61	58	95
University	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Waimanalo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pearl City ^c	103/77/10	9	4	1	0	0	0	0	0	0	0	0	0	0	1	366	292	80
Makaiwa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kapolei ^{b,c}	20/7	6	3	0	0	0	0	0	0	0	0	0	0	0	0	121	99	82
West Beach	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KAUAI																		
Lihue	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MAUI																		
Kihei ^{b,c}	10/9	9	5	0	0	0	0	0	0	0	0	0	0	0	0	121	102	84
HAWAII																		
Kona	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hilo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lava Tree	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Puna E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Puna H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

^a Sampling is once every 6 days ^b Sampling is once every 3 days ^c The first data listed is due to fireworks, the highest non-flagged value recorded in the year is in bold

Table 4-3 Annual Summary of Nitrogen Dioxide

[illegible]

Table 4-4 Annual Summary of 1-Hour Carbon Monoxide

	Annual Statistics																	
	<u>Maximum</u>		<u>Annual Means</u>	<u>1-hour Occurrences Greater than 40,000 µg/m³</u>												Possible Periods	Valid Periods	Percent Recovery
	1 st High	2 nd High	All Hours	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
OAHU																		
Honolulu	2736	2736	680	0	0	0	0	0	0	0	0	0	0	0	0	8784	8673	99
Liliha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Waikiki ^a	3306	3192	765	0	0	0	0	0	0	0	0	0	0	0	0	6576	6475	98
Sand Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
University	3762	3078	948	0	0	0	0	0	0	0	0	0	0	0	0	8784	8730	99
Waimanalo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pearl City	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Makaiwa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kapolei	2394	1710	413	0	0	0	0	0	0	0	0	0	0	0	0	8784	8507	97
West Beach	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KAUAI																		
Lihue	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MAUI																		
Kihei	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HAWAII																		
Kona	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hilo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lava Tree	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Puna E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Puna H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

^a Waikiki station was permanently discontinued as of 11/1/04

Table 4-5 Annual Summary of 8-Hour Carbon Monoxide

	Annual Statistics																	
	<u>Maximum</u>		<u>Annual Means</u>	<u>8-hour Occurrences Greater than 10,000 µg/m³</u>												Possible Periods	Valid Periods	Percent Recovery
	1 st High	2 nd High	All Hours	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
OAHU																		
Honolulu	1496	1496	680	0	0	0	0	0	0	0	0	0	0	0	0	8784	8684	99
Liliha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Waikiki ^a	2081	1781	765	0	0	0	0	0	0	0	0	0	0	0	0	6576	6472	98
Sand Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
University	2323	2323	948	0	0	0	0	0	0	0	0	0	0	0	0	8784	8738	99
Waimanalo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pearl City	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Makaiwa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kapolei	983	955	412	0	0	0	0	0	0	0	0	0	0	0	0	8784	8484	97
West Beach	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KAUAI																		
Lihue	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MAUI																		
Kihei	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HAWAII																		
Kona	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hilo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lava Tree	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Puna E	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Puna H	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

^a Waikiki station was permanently discontinued as of 11/1/04

Table 4-6 Annual Summary of 3-Hour Sulfur Dioxide

[illegible]

Table 4-7 Annual Summary of 24-Hour Sulfur Dioxide

[illegible]

Table 4-8 Annual Summary of 1-Hour Ozone

[illegible]

Table 4-9 Annual Summary of 8-Hour Ozone

[illegible]

Table 4-10 Annual Summary of 1-Hour Hydrogen Sulfide

	Annual Statistics																	
	<u>Maximum</u>		<u>Annual Means</u>	<u>1-hour Occurrences Greater than 35 µg/m³</u>												Possible Periods	Valid Periods	Percent Recovery
	1 st High	2 nd High	All Hours	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec			
OAHU																		
Honolulu	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Liliha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Waikiki	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sand Island	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
University	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Waimanalo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pearl City	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Makaiwa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Kapolei	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
West Beach	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
KAUAI																		
Lihue	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MAUI																		
Kihei	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HAWAII																		
Kona	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hilo	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lava Tree	14	11	4	0	0	0	0	0	0	0	0	0	0	0	0	8784	8202	93
Puna E	8	8	2	0	0	0	0	0	0	0	0	0	0	0	0	8784	7854	89
Puna H	6	6	1	0	0	0	0	0	0	0	0	0	0	0	0	8784	8198	93

Table 4-11 Monthly Summary of 24-Hour PM₁₀ (µg/m³)

(The month with the highest annual value is highlighted, value(s) due to New Year's fireworks excluded) NV = No values

Station		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Honolulu	Range	8 - 36	10 - 22	8 - 20	6 - 32	6 - 24	7 - 15	7 - 16	8 - 16	7 - 14	7 - 16	8 - 28	9 - 39
	Average	17	15	13	15	13	11	12	12	10	12	14	16
Liliha	Range	7 - 45	10 - 25	9 - 23	8 - 32	4 - 26	7 - 16	8 - 17	9 - 18	8 - 18	8 - 19	8 - 32	6 - 72
	Average	18	16	15	17	14	12	12	13	12	14	15	18
Pearl City	Range	8 - 94	5 - 19	9 - 21	9 - 32	8 - 22	8 - 15	6 - 17	10 - 20	8 - 15	10 - 26	8 - 23	15 - 131
	Average	18	13	14	16	14	11	12	12	12	18	15	23
Waimanalo (1 in 6 days)	Range	9 - 17	8 - 18	11 - 27	10 - 18	5 (One Sample)	11 - 16	NV	12 - 22	9 - 21	11 - 19	NV	NV
	Average	13	13	17	15	14	14		16	15	15		
Kapolei	Range	8 - 29	8 - 29	9 - 26	4 - 53	5 - 19	8 - 17	7 - 18	8 - 41	8 - 34	8 - 17	7 - 23	11 - 54
	Average	14	15	14	18	12	10	12	13	12	12	12	18
West Beach (1 in 6 days)	Range	17 - 22	14 - 20	9 - 16	6 - 17	8 - 13	8 - 13	12 - 14	3 - 14	3 - 14	9 - 14	8 - 17	11 - 17
	Average	20	17	12	13	11	11	13	9	11	11	12	13
Lihue (1 in 6 days)	Range	12 - 16	10 - 18	8 - 24	12 - 23	10 - 21	10 - 17	12 - 19	11 - 28	13 - 20	11 - 20	15 - 23	13 - 24
	Average	14	13	14	17	15	14	15	18	16	16	18	18
Kihei	Range	0 - 33	8 - 22	9 - 28	8 - 29	10 - 26	13 - 44	17 - 62	7 - 44	9 - 65	13 - 34	10 - 24	8 - 36
	Average	13	14	16	17	17	20	28	22	26	20	17	18
Hilo (1 in 6 days)	Range	8 - 22	14 - 29	9 - 16	10 - 12	8 - 25	11 - 12	10 - 15	4 - 13	8 - 14	10 - 14	16 - 21	12 - 14
	Average	17	19	12	11	15	12	12	10	12	12	19	13

The state and federal 24-hr PM₁₀ standards are 150 µg/m³

Table 4-12 Monthly Summary of 24-Hour PM_{2.5} (µg/m³)

(The month with the highest annual value is highlighted, value(s) due to New Year's fireworks excluded)

Station		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Honolulu (daily)	Range	2 - 15	2 - 9	2 - 7	2 - 9	1 - 10	1 - 4	0 - 7	1 - 6	1 - 3	1 - 6	1 - 7	2 - 20
	Average	6	4	4	5	4	3	3	3	2	3	4	5
Pearl City (daily)	Range	1 - 77	2 - 10	2 - 6	2 - 9	2 - 7	2 - 7	2 - 7	1 - 6	1 - 4	2 - 8	1 - 6	3 - 103
	Average	6	4	4	4	4	3	3	3	3	4	3	7
Sand Island (1 in 6 days)	Range	5 - 6	2 - 6	3 - 10	3 - 6	4 - 5	3 - 5	2 - 8	2 - 6	3 - 5	3 - 7	3 - 7	3 - 7
	Average	5	5	6	5	5	4	5	5	4	5	5	5
Kapolei (1 in 3 days)	Range	2 - 20	1 - 5	3 - 7	2 - 6	3 - 6	2 - 4	1 - 5	2 - 4	1 - 3	2 - 4	1 - 5	2 - 5
	Average	5	3	4	4	4	3	3	2	2	3	3	4
Kihei (1 in 3 days)	Range	2 - 10	3 - 7	3 - 8	3 - 8	3 - 9	3 - 6	3 - 9	2 - 7	3 - 5	3 - 7	3 - 9	1 - 7
	Average	4	5	5	5	6	4	5	5	4	5	6	3

The federal 24-hr PM_{2.5} standard is 65 µg/m³

Table 4-13 Monthly Summary of 24-Hour Nitrogen Dioxide (µg/m³)

(The month with the highest annual value is highlighted)

Station		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Kapolei	Range	4 - 18	1 - 15	3 - 19	5 - 11	5 - 15	6 - 11	6 - 10	5 - 14	8 - 13	6 - 15	7 - 16	6 - 23
	Average	10	8	8	8	8	8	8	8	9	10	12	12
West Beach	Range	2 - 18	3 - 16	2 - 17	2 - 12	3 - 15	2 - 7	2 - 7	2 - 11	1 - 7	1 - 11	1 - 15	2 - 17
	Average	9	9	7	7	7	4	4	5	4	5	6	7

There are no 24-hour state or federal standards for nitrogen dioxide

Table 4-14 Monthly Summary of 1-Hour Carbon Monoxide ($\mu\text{g}/\text{m}^3$)

(The month with the highest annual value is highlighted)

Station		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Honolulu	Range	456-2736	342-2394	456-2052	342-2394	342-1482	456-1368	228-2166	228-1596	342-1482	0-1824	0-2736	0-2622
	Average	873	846	724	753	579	706	466	529	567	801	631	711
Waikiki	Range	570-3306	0-2508	114-2508	570-2166	228-1938	114-1368	342-2052	456-1710	570-2394	Station closed		
	Average	1092	767	613	902	727	485	630	748	920			
University	Range	456-3078	342-3078	228-2394	570-2964	342-2166	342-3762	342-1938	0-2166	228-2280	342-2508	342-2622	342-2736
	Average	1136	1159	859	977	864	900	788	871	868	946	955	1061
Kapolei	Range	228-1140	0-1140	228-1140	114-1368	228-912	114-570	228-912	114-912	228-1026	342-1254	342-2394	342-1368
	Average	373	456	350	466	398	341	373	326	397	535	467	516

The state 1-hr CO standard is $10,000 \mu\text{g}/\text{m}^3$, the federal 1-hr CO standard is $40,000 \mu\text{g}/\text{m}^3$

Table 4-15 Monthly Summary of 8-Hour Carbon Monoxide ($\mu\text{g}/\text{m}^3$)

(The month with the highest annual value is highlighted)

Station		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Honolulu	Range	456-1482	385-1496	456-1154	342-1425	342-941	527-998	299-969	228-1169	399-893	527-1268	271-1482	371-1254
	Average	877	850	723	755	579	704	468	530	566	799	636	708
Waikiki	Range	656-2081	185-1454	185-1354	599-1468	314-1354	157-1045	428-912	499-1482	670-1211	Station closed		
	Average	1095	771	611	901	728	485	629	748	919			
University	Range	542-1967	371-2323	342-1781	627-2009	371-1753	385-1596	442-1368	456-1895	271-1724	385-1895	371-1924	399-2323
	Average	1140	1159	859	975	867	897	788	871	868	945	958	1058
Kapolei	Range	242-641	114-755	228-599	200-727	228-542	171-470	228-532	179-542	228-527	342-741	342-983	356-798
	Average	374	457	348	466	358	341	372	327	396	534	467	515

The state 8-hr CO standard is $5,000 \mu\text{g}/\text{m}^3$, the federal 8-hr CO standard is $10,000 \mu\text{g}/\text{m}^3$

Table 4-16 Monthly Summary of 3-Hour Sulfur Dioxide ($\mu\text{g}/\text{m}^3$)

(The month with the highest annual value is highlighted)

Station		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Honolulu	Range	0 - 56	0 - 44	0 - 34	0 - 30	0 - 30	0 - 3	0 - 4	0 - 16	0 - 19	0 - 6	0 - 21	0 - 10
	Average	3	1	1	1	1	<1	1	1	2	3	2	1
Makaiwa	Range	0 - 44	0 - 25	0 - 36	0 - 41	0 - 37	0 - 10	0 - 27	0 - 46	0 - 26	3 - 21	3 - 25	0 - 36
	Average	3	2	2	2	3	3	3	3	2	3	5	5
Kapolei	Range	0 - 7	0 - 3	0 - 8	0 - 12	0 - 8	0 - 1	0 - 3	0 - 6	0 - 6	0 - 11	0 - 17	0 - 8
	Average	1	<1	<1	1	4	<1	<1	<1	3	2	1	<1
West Beach	Range	0 - 5	0 - 3	0 - 3	0 - 10	0 - 5	0 - 3	0 - 2	0 - 3	0 - 3	0 - 3	0 - 9	0 - 10
	Average	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1	2
Kona	Range	5 - 55	8 - 47	4 - 26	3 - 26	5 - 19	5 - 28	3 - 22	0 - 25	1 - 17	3 - 23	3 - 47	3 - 24
	Average	10	12	11	8	6	8	7	4	5	6	7	7
Hilo	Range	0 - 182	0 - 238	0 - 333	2 - 12	3 - 173	1 - 5	3 - 10	3 - 174	1 - 199	0 - 92	3 - 184	3 - 427
	Average	12	9	9	3	9	3	3	4	5	4	8	17

The state and federal 3-hr SO_2 standards are $1300 \mu\text{g}/\text{m}^3$

Table 4-17 Monthly Summary of 24-Hour Sulfur Dioxide ($\mu\text{g}/\text{m}^3$)

(The month with the highest annual value is highlighted)

Station		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Honolulu	Range	0 - 25	0 - 11	0 - 6	0 - 7	0 - 8	0 - 1	0 - 3	0 - 3	0 - 3	0 - 5	<1 - 11	<1 - 3
	Average	3	1	1	1	1	<1	1	1	2	3	2	1
Makaiwa	Range	0 - 11	0 - 8	0 - 15	0 - 9	1 - 9	2 - 4	2 - 7	1 - 12	0 - 6	3 - 7	3 - 10	3 - 12
	Average	3	2	2	2	3	3	4	3	2	3	5	5
Kapolei	Range	0 - 3	0 - 1	0 - 2	0 - 6	<1 - 6	0 - <1	0 - 1	0 - 3	1 - 4	<1 - 4	0 - 7	0 - 2
	Average	1	<1	<1	1	4	<1	<1	<1	2	2	1	<1
West Beach	Range	0 - 1	0 - 1	0 - 1	0 - 2	0 - 1	0 - 1	0 - <1	0 - 3	0 - 1	0 - 2	0 - 4	0 - 4
	Average	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1	1
Kona	Range	7 - 21	8 - 18	6 - 18	5 - 12	5 - 9	5 - 13	3 - 11	1 - 8	3 - 8	3 - 11	3 - 16	5 - 17
	Average	10	12	11	8	6	8	7	4	5	6	7	7
Hilo	Range	1 - 55	<1 - 44	2 - 79	3 - 5	3 - 52	3 - 3	3 - 5	3 - 41	2 - 45	1 - 20	3 - 37	3 - 107
	Average	13	9	9	3	9	3	3	4	5	4	7	17

The state and federal 24-hr SO_2 standards are $365 \mu\text{g}/\text{m}^3$

Table 4-18 Monthly Summary of 1-Hour Ozone ($\mu\text{g}/\text{m}^3$)

(The month with the highest annual value is highlighted)

Station		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Sand Island	Range	4 - 86	4 - 102	4 - 118	4 - 100	4 - 88	6 - 49	0 - 41	0 - 41	2 - 49	0 - 69	0 - 78	0 - 80
	Average	40	41	53	49	32	27	17	20	26	28	32	38

The federal 1-hr O_3 standard is $235 \mu\text{g}/\text{m}^3$

Table 4-19 Monthly Summary of 8-Hour Ozone ($\mu\text{g}/\text{m}^3$)

(The month with the highest annual value is highlighted)

Station		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Sand Island	Range	5 - 76	6 - 87	6 - 110	9 - 95	6 - 74	11 - 47	5 - 37	2 - 37	4 - 43	4 - 60	1 - 76	6 - 73
	Average	40	41	53	50	32	27	17	20	26	28	32	38

The state and federal 8-hr O_3 standards are $157 \mu\text{g}/\text{m}^3$

Table 4-20 Monthly Summary of 1-Hour Hydrogen Sulfide ($\mu\text{g}/\text{m}^3$)

(The month with the highest annual value is highlighted)

Station		Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Lava Tree	Range	1 - 10	4 - 10	3 - 11	0 - 10	1 - 7	1 - 6	1 - 10	1 - 10	1 - 7	3 - 8	1 - 14	4 - 11
	Average	4	5	6	2	2	2	2	2	3	3	5	7
Puna E	Range	4 - 7	4 - 7	4 - 7	4 - 8	0 - 8	0 - 3	0 - 3	0 - 6	0 - 4	0 - 6	0 - 3	0 - 3
	Average	5	5	5	6	2	1	0	0	0	0	0	0
Puna H	Range	0 - 6	0 - 3	0 - 4	1 - 4	0 - 6	0 - 4	1 - 4	1 - 4	0 - 6	0 - 0	0 - 1	0 - 1
	Average	1	1	1	2	2	1	2	2	1	0	0	0

The state H_2S standard is $35 \mu\text{g}/\text{m}^3$, there is no federal ambient air standard for H_2S

Section 5

PM_{2.5} SPECIATION DATA



Speciation sampler at the Pearl City station

Atmospheric aerosols are solid or liquid particles suspended in air that come directly from a variety of sources (primary) or are formed by chemical reactions (secondary). Sources include dust from roads, construction, and agriculture; combustion particles from motor vehicles, electric utilities and agricultural burning; and particles from natural sources such as the ocean or volcano.

Most of the PM_{2.5} is a combination of the following components: sulfates, nitrates, ammonium, elemental carbon, organic compounds, water and metals.

The filter-based speciation sampler at the Pearl City monitoring station collects samples once every 6 days for analyses performed by an EPA contract laboratory.

Table 5-1 lists the parameters measured, highest and second highest values recorded in the year, the annual arithmetic mean of all valid samples and the total number of samples collected in the year. Table 5-2 lists the analysis methods for each parameter.

With the exception of lead, there are no ambient air quality standards for the individual components of speciated PM_{2.5}.

Table 5-1 Annual Summary of PM_{2.5} Speciation Parameters

Parameter	1st High µg/m³	2nd High µg/m³	Annual Arithmetic Mean	No. of Samples
CARBON				
Organic Carbon	5.06	2.25	1.539	61
Elemental Carbon	0.66	0.56	0.245	61
METALS				
Antimony	0.069	0.063	0.0145	60
Arsenic	0.005	0.004	0.0014	60
Aluminum	0.085	0.047	0.0149	60
Barium	0.044	0.044	0.02	60
Bromine	0.004	0.003	0.0015	60
Cadmium	0.020	0.010	0.0061	60
Calcium	0.054	0.054	0.0272	60
Chromium	0.005	0.004	0.0014	60
Cobalt	0.003	0.002	0.0009	60
Copper	0.013	0.007	0.0027	60
Chlorine	1.57	1.53	0.4854	60
Cerium	0.065	0.065	0.0291	60
Cesium	0.028	0.028	0.0139	60
Europium	0.009	0.009	0.0038	60
Gallium	0.004	0.004	0.0022	60
Iron	0.073	0.058	0.03	60
Hafnium	0.020	0.020	0.0127	60
Lead	0.005	0.004	0.0028	60
Indium	0.034	0.009	0.0072	60
Manganese	0.004	0.003	0.0012	60
Iridium	0.009	0.009	0.0044	60
Molybdenum	0.012	0.011	0.0045	60
Nickel	0.014	0.013	0.009	60
Magnesium	0.113	0.088	0.0215	60
Mercury	0.008	0.006	0.0027	60
Gold	0.007	0.007	0.0037	60
Lanthanum	0.050	0.050	0.0225	60
Niobium	0.003	0.003	0.0024	60
Phosphorus	0.006	0.006	0.0045	60
Selenium	0.002	0.002	0.0015	60
Tin	0.050	0.040	0.0108	60
Titanium	0.009	0.009	0.0030	60
Samarium	0.008	0.005	0.0031	60
Scandium	0.007	0.007	0.0017	60
Vanadium	0.007	0.004	0.0016	60
Silicon	0.149	0.130	0.0271	60

Table 5-1 Continued

Parameter	1 st High µg/m ³	2 nd High µg/m ³	Annual Arithmetic Mean	No. of Samples
Silver	0.024	0.012	0.0055	60
Zinc	0.013	0.011	0.0018	60
Strontium	0.005	0.004	0.0017	60
Sulfur	0.917	0.839	0.2681	60
Tantalum	0.026	0.015	0.0084	60
Terbium	0.006	0.006	0.0032	60
Rubidium	0.002	0.002	0.0011	60
Potassium	0.072	0.053	0.0250	60
Yttrium	0.002	0.002	0.0016	60
Sodium	0.877	0.843	0.2598	60
Zirconium	0.006	0.005	0.0024	60
Tungsten	0.023	0.011	0.0068	60
IONS				
Ammonium Ion	0.77	0.77	0.113	61
Sodium Ion	1.14	1.03	0.565	61
Potassium Ion	0.13	0.07	0.013	61
Total Nitrate	0.66	0.55	0.239	61
Sulfate	3.21	3.00	0.914	61

Table 5-2 Speciation Collection and Analysis Methods

Parameter	Collection Method	Analysis Method
Carbon	SASS ¹ Quartz Filter	Thermal Optical Transmittance
Metals	SASS Teflon Filter	Energy Dispersive XRF
Ions	SASS Nylon Filter	Ion Chromatography

¹ Trademarked equipment: Speciation Air Sampling System

Section 6

AMBIENT AIR QUALITY TRENDS



Makaiwa monitoring station

The following graphs illustrate 5-year trends for SLAMS and NAMS stations monitoring for PM_{10} , $PM_{2.5}$, ozone, carbon monoxide, sulfur dioxide, and nitrogen dioxide from 2000 to 2004.

The graphs for PM_{10} , $PM_{2.5}$, sulfur dioxide and nitrogen dioxide (figures 6-1, 6-2, 6-3 and 6-4, respectively) represent the annual averages for each year and for each station that monitors for that pollutant. Annual averages are derived by calculating the arithmetic mean of all valid hours recorded in the year. Included in the graphs are the state and federal annual standard(s).

The graphs for 1-hour ozone, 1-hour carbon monoxide, and 8-hour carbon monoxide (figures 6-5, 6-6 and 6-7, respectively) represent the average of the daily maximum 1-hour or 8-hour values recorded in the year. These values are obtained by taking the highest recorded 1-hour or 8-hour value for each day then calculating the arithmetic mean of all those hours to arrive at the annual maximum average. Ozone and carbon monoxide do not have state or federal annual standards, however, included in the graphs are the 1-hour and 8-hour standards.

Air quality in the State of Hawaii continues to be one of the best in the nation, and criteria pollutant levels remain well below state and federal ambient air quality standards.

Figure 6-1 PM₁₀ Annual Average 2000 - 2004

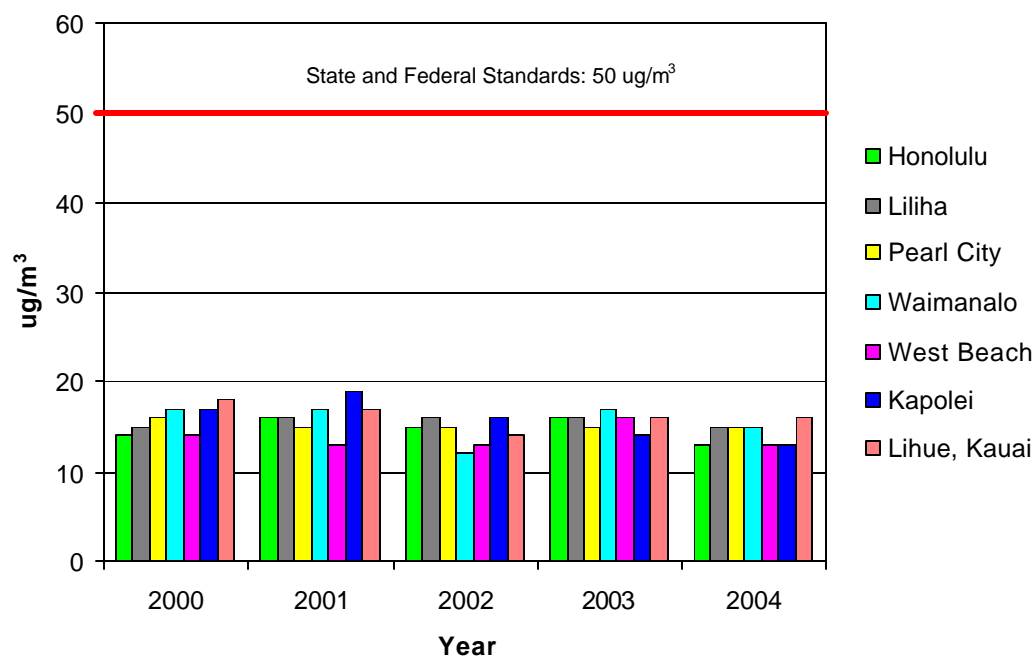
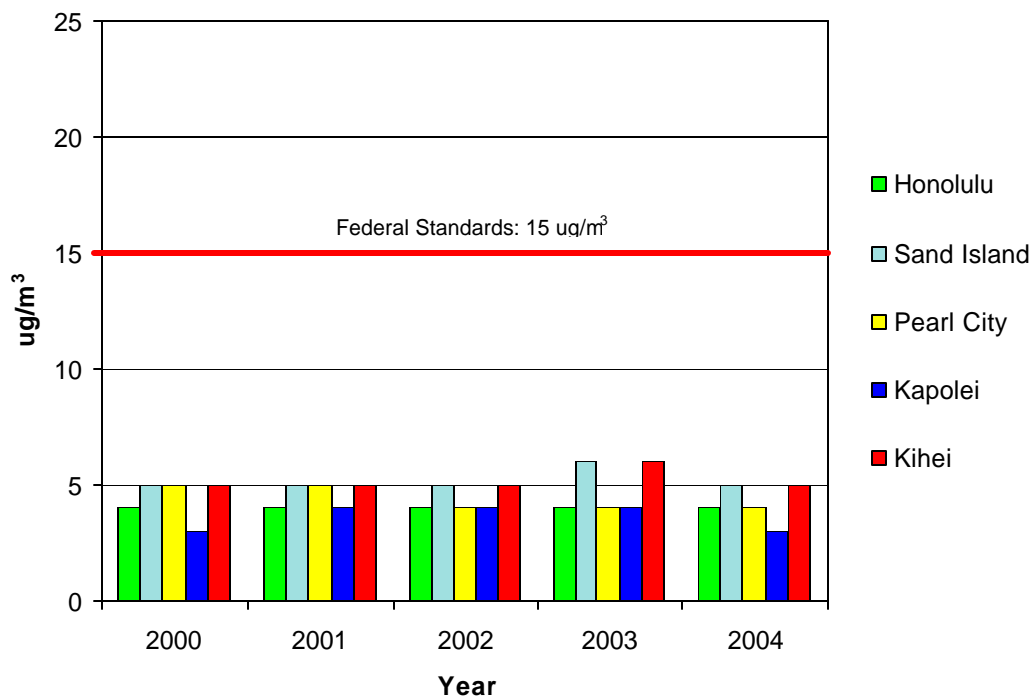
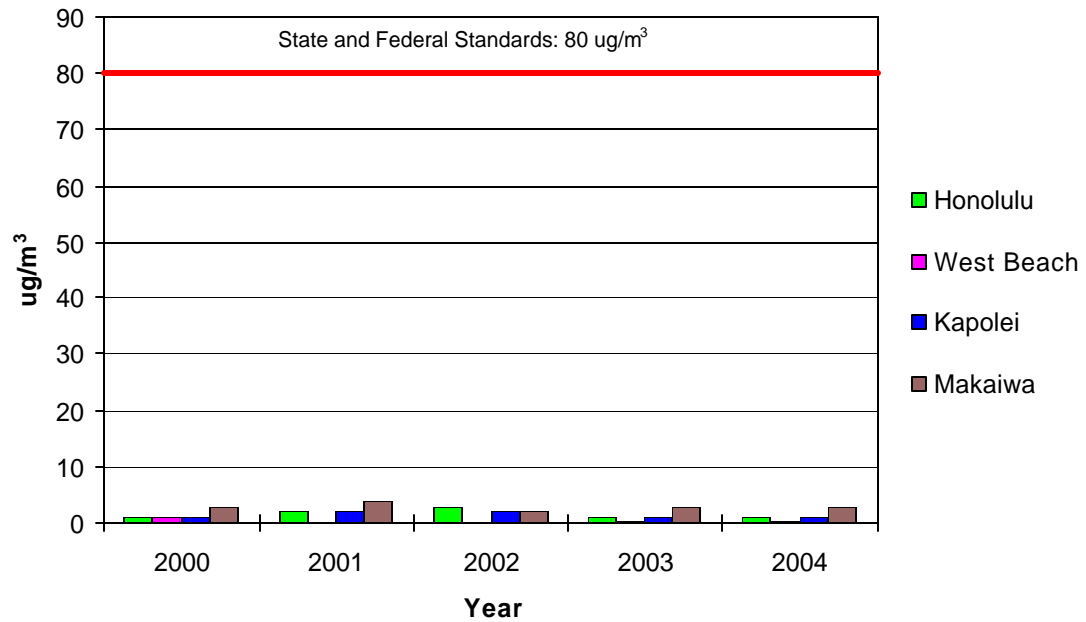


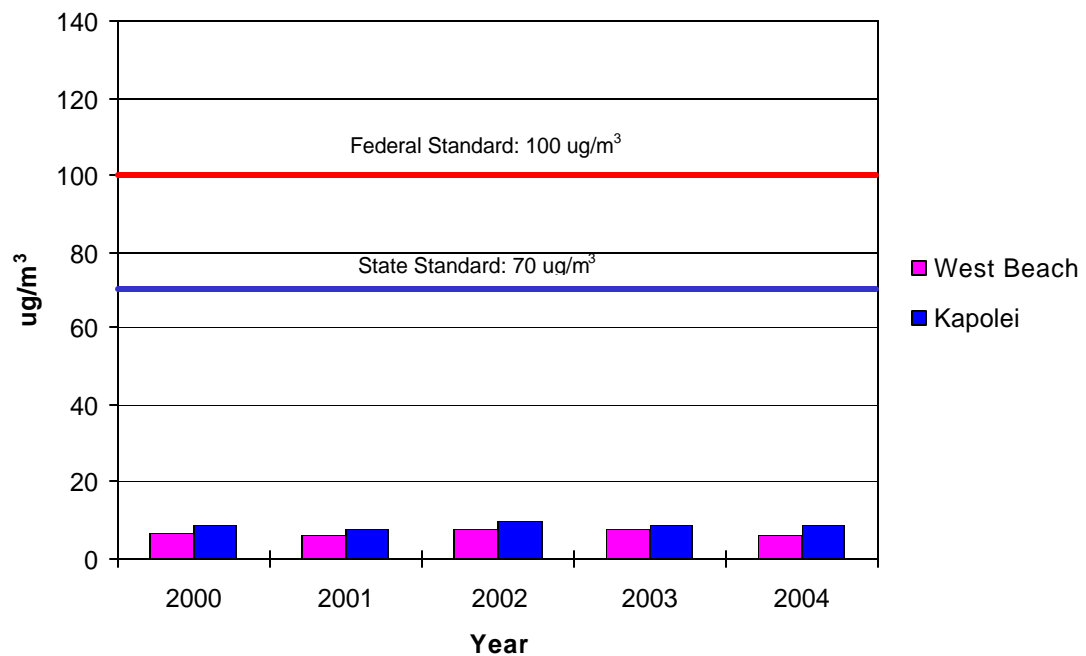
Figure 6-2 PM_{2.5} Annual Average 2000 - 2004



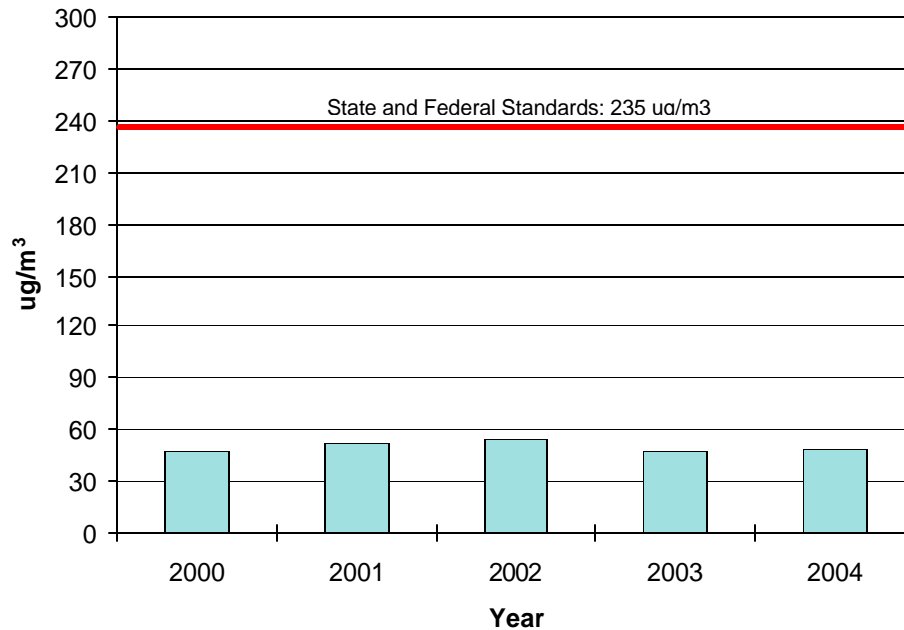
**Figure 6-3 Annual Average Sulfur Dioxide
2000 - 2004**



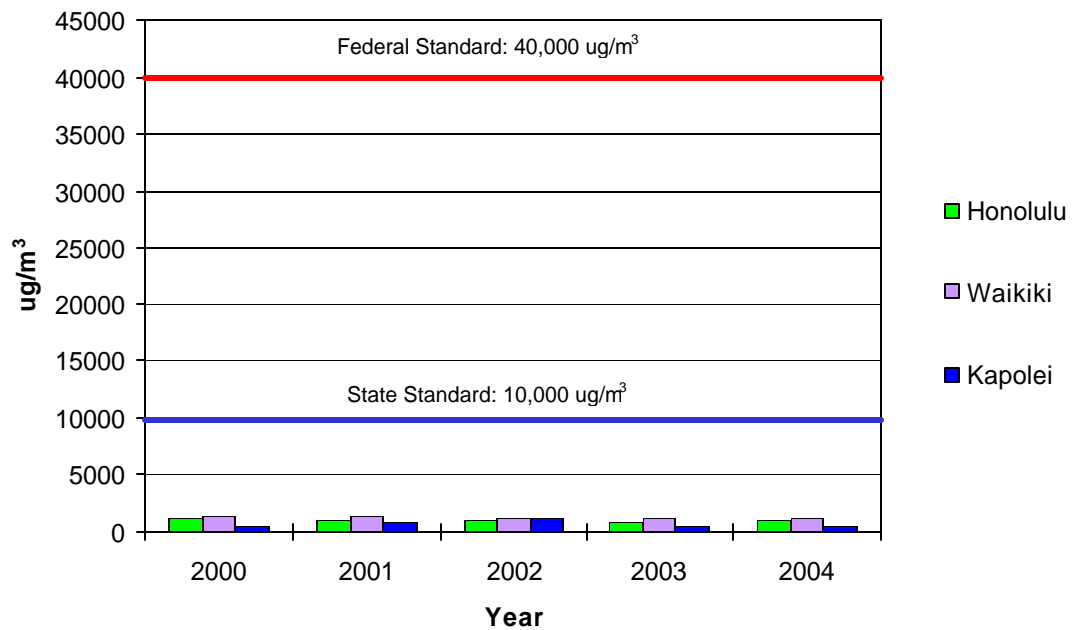
**Figure 6-4 Annual Average Nitrogen Dioxide
2000 - 2004**



**Figure 6-5 Annual Average of Daily Maximum
1-Hour Ozone 2000 - 2004**



**Figure 6-6 Annual Average of Daily Maximum
1-Hour Carbon Monoxide
2000 - 2004**



**Figure 6-7 Annual Average of Daily Maximum
8-Hour Carbon Monoxide
2000 - 2004**

